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# Bed Bugs • HOW TO CONTROL THEM



Bed bugs are sometimes called "red coats," "chinchies," or "mahogany flats."

In most parts of the United States there is only one species, known scientifically as *Cimex lectularius*. Another species, *Cimex hemipterus*, is common in Florida and perhaps in some of the other Southern States.

The bed bug feeds on blood—principally that of man. It feeds by piercing the skin with its elongated beak.

If you discover bed bugs in your home, or in your place of business, you may wonder where they came from. Bed bugs are spread chiefly by these means: Clothing and baggage of travelers and visitors; secondhand beds, bedding, and furniture; and laundry. Operators of public gathering places, such as hotels and theaters, find that bed bugs are brought to these places by patrons, and they have to make constant efforts to prevent infestations.

## What They Look Like

The mature bed bug is a brown, wingless insect. Its size depends upon the amount of food (blood) that the body contains. An unfed specimen is between  $\frac{1}{4}$  and  $\frac{3}{8}$  inch long. The upper surface of the body has a flimsy, crinkly appearance.

When engorged with blood, the body becomes elongated and swollen and the color changes from brown to dull red. The change in size, shape, and color is so great that persons seeing a number of the bugs in different stages of distension may believe that they are looking at individuals belonging to two or more species.

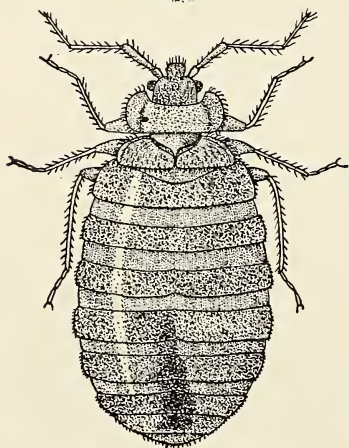
Bed bug eggs are white, and about  $\frac{1}{32}$  inch long. The newly hatched bugs are translucent and nearly colorless. The young bugs are similar in shape to the adults. As they grow, they molt (shed their skins). After each molt they are at first pale, then become brownish. Immediately after feeding, the bodies are blood-red.

To know that bed bugs are in a room, you do not always have to see them. If they are numerous, you will probably notice the offensive odor that is associated with bed bug infestations. The odor comes from an oily liquid emitted by the bugs.

## Feeding Habits

Bed bugs do almost all their feeding at night, by biting people who are asleep. The bites are usually painless when inflicted.

When bed bugs bite, they inject into the skin a fluid that assists them in obtaining blood. Often the fluid causes the skin to become irritated



**MATURE BED BUG**

Above: Before engorgement. Below: After engorgement with blood (shows distension of body and altered appearance). Much enlarged.

and inflamed; welts develop, and there is much itching. It has never been proved that bed bugs are disease carriers in the United States.

If very hungry, and if the light is dim, the bugs will feed during the day. Their habit of night feeding is necessarily changed when they infest places where people do not stay throughout the night—for example, theaters (where bed bugs may use the seats as hiding places). In such places they often bite people during the day.

If its feeding is unmolested, a full-grown bed bug becomes engorged with

blood in 3 to 5 minutes. It then crawls to its hiding place, where it remains for several days digesting its meal. When hunger returns, the bug emerges from hiding and seeks another meal of blood.

Bed bugs may be serious pests in poultry houses and in buildings where rabbits, rats, and guinea pigs are maintained for experimental purposes. They may also feed on small animals and birds that are kept about the home as pets. Poultry, pets, and experimental animals may be weakened by loss of blood due to bed bug attack.

Some persons believe that bed bugs develop in trees and can subsist on sap, or on the dried juices of seasoned wood in houses. This is not true. Others believe that bed bugs can subsist on dirt in floor cracks and other places in buildings. Bed bugs are often seen in these places, but they are not feeding there.

### **How Bed Bugs Develop**

Under favorable conditions, the mature female bed bug lives 2 to 10 months, and lays about 200 eggs. When the insects have the opportunity to feed regularly, eggs are laid at an average rate of three or four a day. Maximum egg laying occurs when the temperature is above 70° F. No eggs are laid at temperatures lower than 50° and very few between 50° and 60°.

At temperatures above 70° F. the eggs hatch in 6 to 17 days. At lower temperatures hatching may take as long as 28 days. When first laid, the eggs are coated with a sticky substance, which dries at once, causing the eggs to adhere to the object on which they were deposited. The unhatched eggs and the eggshells are



seen, singly or in clusters, about the cracks and crevices in which the bugs hide.

The newly hatched bugs feed at the first opportunity. They molt five times before reaching maturity. Piles of the white, fluffy skins often accumulate near places where the bugs hide.

During warm weather, or in houses continuously heated, growth requires from 4 to 6 weeks. Following is the record of the development of a bed bug that was kept in a room in which the temperature was above 70° F.: The bed bug was hatched on January 30. It was given an opportunity to feed on human blood each day. It fed on January 30 and on February 4, 9, 15, and 23. It molted on February 3, 8, 12, 19, and 28. After becoming mature through its molt on February 28, it did not feed until March 17. This individual record probably shows typical development of young bed bugs under ideal temperature and food conditions.

In 1 year there may be three or four generations, or even more, particularly in homes and public sleeping quarters that are heated continuously during the winter months.

There is considerable variation in the period of development, even among bugs hatching at the same time. As a result, bed bugs in all stages of development are present at all seasons of the year, except in unheated rooms in winter, when only adults may be present.

## Length-of-Life Studies

When bed bugs have been carried to places where they find no food, how long can they live? How long can they live in unoccupied houses?

These questions suggest a type of information that is useful in bed bug control. To get the answers, entomologists have made studies on the length of time that bed bugs can live without food.

Newly hatched bed bugs may live without feeding for several weeks during warm weather and for several months during cool weather. If given an opportunity to feed occasionally, they may live about 10 months. It is common for older bed bugs to go 2 weeks to 2 months, or longer, without food. It is believed that under some conditions bed bugs can live a year or longer without food.



THE BED BUG . . . Left: Larval skin shed at first molt. Center: Second larval stage (immediately after first molt). Right: Same after first meal, distended with blood. Much enlarged.

# HOW TO CONTROL BED BUGS

Control of bed bugs is generally directed at those infesting private homes, public sleeping quarters, poultry houses, or animal houses. Regardless of the location of an infestation, begin the control procedure by finding the places where the bugs hide in the daytime. Next, use an insecticide; spray it directly into the hiding places.

## Where Bed Bugs Hide

Habitual hiding places are usually made evident by black or brown spots that stain surfaces on which the bugs rest. These spots are the dried excrement of the bugs. Bed bug eggs, eggshells, and cast skins may also be seen near these places. (See *How Bed Bugs Develop*, p. 2.)

At the beginning of an infestation in a bedroom, bed bugs are likely to be found only on the beds. At first they are apt to hide about the tufts, seams, and folds of mattresses and daybed covers; later they spread to cracks and crevices of the bedsteads.

If allowed to become more numerous, or if control efforts have been haphazard, the bugs usually become scattered. They establish themselves behind baseboards, window and door casings, pictures, and picture moldings, and in furniture, loosened wallpaper, and cracks in plaster. Partitions made of composition board or sheathing may contain many cracks in which bed bugs can hide.

Search in all these places. Do not overlook upholstered furniture in a bedroom or in some other room that may also be used as a bedroom.

## What Kind of Insecticide?

DDT and pyrethrum are the insecticides that are most effective against bed bugs. Both are used in sprays. DDT dust (10 percent) is also used.

Insecticides can be bought at most drug, hardware, and department stores, and at some food markets.

## DDT Sprays

DDT sprays give long-lasting protection. Kerosene solutions, emulsions, and suspensions are used in bed bug control. A solution or an emulsion should contain 5 percent of DDT; a suspension should contain 2.5 percent of DDT.

The kerosene solution may be purchased ready for use. An emulsion is prepared by mixing an emulsifiable concentrate with water, and a suspension by mixing a wettable powder with water. The products on the market contain various percentages of DDT. The exact percentage is stated on the label.

If you buy an emulsifiable concentrate that contains 25 percent of DDT, make a 5-percent emulsion spray by adding 1 part of the concentrate to 4 parts of water. If you buy a wettable powder that contains 50 percent of DDT, make a 2.5-percent spray by adding 1 pound of the powder to 2½ gallons of water.

If you buy a product with a higher or lower percentage of DDT than those listed, use a proportionately smaller or larger amount of it.

The kerosene solution is the most effective and satisfactory spray for use against bed bugs in homes. A spray with a refined-kerosene base is desirable because it has little odor.

## Pyrethrum Sprays

Pyrethrum has long been used in controlling bed bugs. It has been improved by addition of a chemical such as piperonyl butoxide, sulfoxide, *n*-propyl isome, or sesame oil concentrate. These chemicals are called synergists.

Pyrethrum sprays for control of bed bugs should contain not less than 0.2 percent of pyrethrins and at least 1 percent of one of the synergists mentioned.

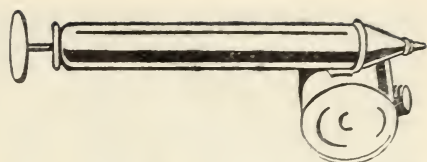
Pyrethrum sprays are not as long-lasting as DDT. However, if you use the concentration of pyrethrins that is suggested, and if you apply the spray thoroughly, you can obtain excellent results.

### What Kind of Sprayer?

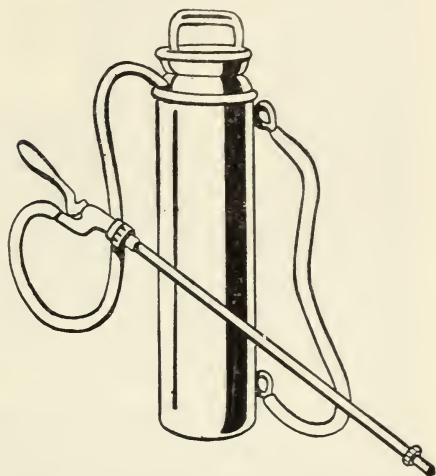
Select a sprayer that produces rather coarse spray particles. An ordinary compressed-air sprayer (the type used for spraying garden plants) is satisfactory. The disk opening should be smaller than that normally used in spraying plants.

If only one or two rooms are to be treated, the job can be done with a small hand sprayer that gives a continuous spray. Sprayers of this type are used for controlling flies and similar insects in the home. The sprayer should be held within a few inches of the surface to be treated.

A small hand sprayer will usually produce considerable mist. Tie a handkerchief or other suitable cloth over the nose and mouth to reduce to a minimum the amount of mist breathed. Keep windows and doors open while spraying. By doing this you will further reduce the amount of mist breathed and you will reduce fire hazard.



Hand sprayer, suitable if only one or two rooms are to be treated.



Compressed-air sprayer, for larger operations.

Several companies make hand sprayers that put out a coarse mist spray and are especially designed for applying insecticides to surfaces.

### How To Use Insecticides

#### Private Homes

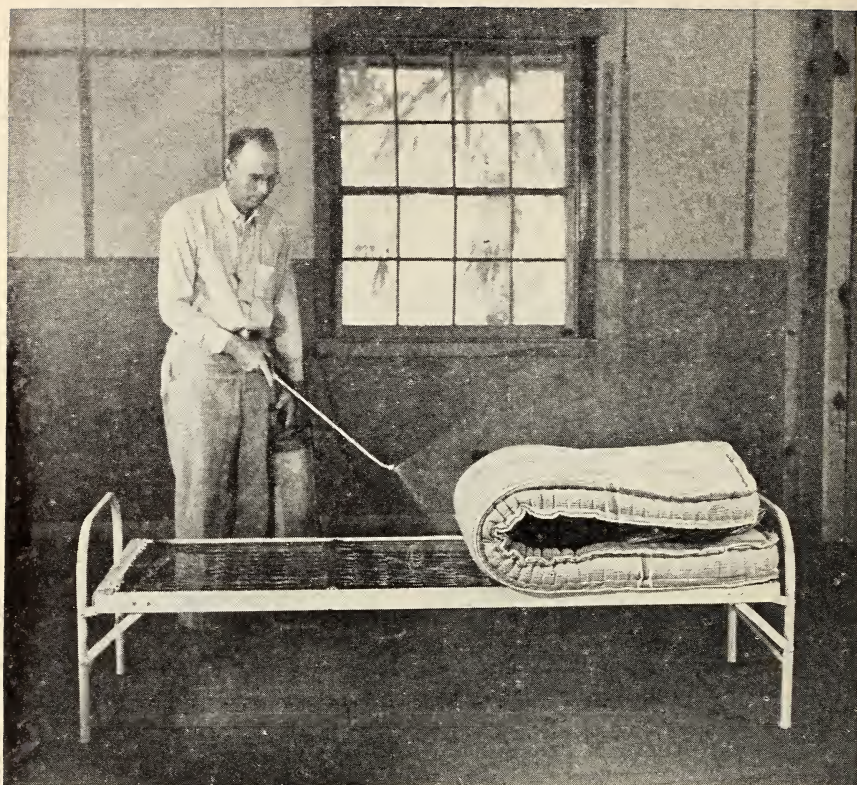
To control bed bugs in a home, spray with DDT (kerosene solution) or pyrethrum.

A single thorough treatment with DDT rids a room of bed bugs within a few days, and the deposit prevents reinfestation for about 6 months.

A pyrethrum spray containing a synergist leaves a deposit that is effective for several weeks. Apply it at 6-week intervals until the bugs are under control.

With either insecticide, good control is obtained only if the spray is





A compressed-air sprayer is satisfactory for spraying mattresses and beds. Apply the spray to the bedframe, springs, and mattress.

applied directly to the bed bugs and their hiding places. Ordinary space sprays or aerosols will not penetrate into the hiding places.

Spray the bed—frames, springs, legs, and all cracks and crevices. Apply a light mist treatment to the entire mattress, and heavier treatment to the seams, tufts, and folds. Air the mattress for at least 4 hours before using.

In treating upholstered furniture, apply DDT spray thoroughly. Repeated treatments may be necessary.

Spray other possible hiding places (see p. 4). If you do this, it will not be necessary to treat walls, ceiling, or floor.

Apply enough spray to wet the surfaces, but not enough to cause runoff or dripping to the floor. The solutions may be applied to the surfaces with a paintbrush, but this takes more time than spraying.

Where it is desired to treat beds that are soon to be occupied, or where other circumstances make quick protection desirable, the use of DDT dust (10 percent) is suggested. But the dust may shake off, and should not be relied upon to give long-lasting protection.

Bed-bug infestations in apartments or row houses may readily spread to adjoining rooms. If an infestation is found in one home or apartment,



the owner should arrange to inspect adjoining properties and apply control measures. An experienced pest-control operator should be called in.

### Public Sleeping Quarters

The control of bed bugs in hotels, sleeping cars, military barracks, and similar places usually involves treating a large number of rooms and beds. To reduce time and labor, special power sprayers should be used. Dealers offer a wide choice of power sprayers.

The places to spray, and the insecticides to use, are the same as those referred to in the discussion of spraying in the home.

It is often desirable to obtain the services of licensed pest-control oper-

ators to control bed bugs. This is particularly true when a large number of rooms or buildings require treatment. These operators have had training and experience in locating bed bug infestations, and have the equipment and "know-how" required for effective application of insecticides. When an infestation is under control, it may be advisable to have the pest-control operator check for infestations at regular intervals. In this way new infestations may be detected and eliminated before they spread throughout the buildings.

### Poultry and Animal Houses

In controlling bed bugs in poultry and animal houses, much can be accomplished by following good sani-



Where a large number of beds must be treated, as in military barracks, a power sprayer speeds up the work. The operators wear masks to prevent the breathing in or swallowing of enough insecticide to be harmful.

## PRECAUTIONS

Avoid unnecessary exposure to insecticides while applying them.

If concentrated material containing DDT is spilled on the skin, wash it off immediately.

Do not contaminate foods and food utensils with insecticides.

Keep doors and windows open while

applying insecticides for bed bug control. The purpose is to avoid excessive breathing of the spray mist and also to avoid fire hazard.

Do not apply oil sprays near an open flame.

Store insecticides where children and pets cannot reach them.

tation practices and by reducing the number of places in which bed bugs can hide. Remove loose boards and other unnecessary objects.

For control of bed bugs in poultry houses, use DDT. Apply it in a kerosene, emulsion, or wettable-powder spray. Treat all surfaces inside the poultry houses, particularly cracks and crevices. Treat to the point where the spray runs off the surface.

In houses where rabbits and guinea pigs are kept, use one of the DDT sprays recommended for treating poultry houses. Or, if you prefer, use a pyrethrum spray of the type recommended for use in the home.

For control of bed bugs in laboratories where rats, mice, and small birds are kept, it is recommended that only a pyrethrum spray be used on surfaces with which the animals or birds are likely to come in contact. For treating cages, use a pyrethrum spray. Bed bug hiding places with which the animals or birds cannot

come in contact—such as cracks and corners in the house—may safely be treated with DDT.

## UPHOLSTERED FURNITURE

Bed bugs may hide in considerable numbers in upholstered furniture in homes, public sleeping quarters, or public gathering places. They can be controlled by spraying the furniture thoroughly and repeatedly with DDT, or by fumigation. Since it is difficult to reach these infestations properly with insecticides, the best way to destroy them is to have the furniture fumigated by a pest-control operator or by a storage company that provides fumigation service.

If furniture is infested, it is likely that bed bugs are also present in other places in the room. Before replacing the fumigated furniture, use an insecticide in the room in the manner previously described.

THIS LEAFLET was prepared by the Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine, Agricultural Research Administration. It brings up to date information on bed bug control that was presented in Leaflet 146, Bedbugs, by E. A. Back, and supersedes that publication.

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